**Fishery Management Report No. 16-30**

# Pasagshak River Weir Report, 2016

**by**

**Mark J. Witteveen**

**November 2016**

**Alaska Department of Fish and Game** **Divisions of Sport Fish and Commercial Fisheries**

## Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

**Weights and measures (metric)**

| | |
|---|---|
| centimeter | cm |
| deciliter | dL |
| gram | g |
| hectare | ha |
| kilogram | kg |
| kilometer | km |
| liter | L |
| meter | m |
| milliliter | mL |
| millimeter | mm |

**Weights and measures (English)**

| | |
|---|---|
| cubic feet per second | $ft^3/s$ |
| foot | ft |
| gallon | gal |
| inch | in |
| mile | mi |
| nautical mile | nmi |
| ounce | oz |
| pound | lb |
| quart | qt |
| yard | yd |

**Time and temperature**

| | |
|---|---|
| day | d |
| degrees Celsius | °C |
| degrees Fahrenheit | °F |
| degrees kelvin | K |
| hour | h |
| minute | min |
| second | s |

**Physics and chemistry**

| | |
|---|---|
| all atomic symbols | |
| alternating current | AC |
| ampere | A |
| calorie | cal |
| direct current | DC |
| hertz | Hz |
| horsepower | hp |
| hydrogen ion activity (negative log of) | pH |
| parts per million | ppm |
| parts per thousand | ppt, ‰ |
| volts | V |
| watts | W |

**General**

| | |
|---|---|
| Alaska Administrative Code | AAC |
| all commonly accepted abbreviations | e.g., Mr., Mrs., AM, PM, etc. |
| all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc. |
| at | @ |
| compass directions: | |
| east | E |
| north | N |
| south | S |
| west | W |
| copyright | © |
| corporate suffixes: | |
| Company | Co. |
| Corporation | Corp. |
| Incorporated | Inc. |
| Limited | Ltd. |
| District of Columbia | D.C. |
| et alii (and others) | et al. |
| et cetera (and so forth) | etc. |
| exempli gratia (for example) | e.g. |
| Federal Information Code | FIC |
| id est (that is) | i.e. |
| latitude or longitude | lat or long |
| monetary symbols (U.S.) | $, ¢ |
| months (tables and figures): first three letters | Jan,...,Dec |
| registered trademark | ® |
| trademark | ™ |
| United States (adjective) | U.S. |
| United States of America (noun) | USA |
| U.S.C. | United States Code |
| U.S. state | use two-letter abbreviations (e.g., AK, WA) |

**Mathematics, statistics**

| | |
|---|---|
| *all standard mathematical signs, symbols and abbreviations* | |
| alternate hypothesis | $H_A$ |
| base of natural logarithm | $e$ |
| catch per unit effort | CPUE |
| coefficient of variation | CV |
| common test statistics | (F, t, $\chi^2$, etc.) |
| confidence interval | CI |
| correlation coefficient (multiple) | R |
| correlation coefficient (simple) | r |
| covariance | cov |
| degree (angular ) | ° |
| degrees of freedom | df |
| expected value | $E$ |
| greater than | > |
| greater than or equal to | ≥ |
| harvest per unit effort | HPUE |
| less than | < |
| less than or equal to | ≤ |
| logarithm (natural) | ln |
| logarithm (base 10) | log |
| logarithm (specify base) | $\log_2$, etc. |
| minute (angular) | ' |
| not significant | NS |
| null hypothesis | $H_O$ |
| percent | % |
| probability | P |
| probability of a type I error (rejection of the null hypothesis when true) | α |
| probability of a type II error (acceptance of the null hypothesis when false) | β |
| second (angular) | " |
| standard deviation | SD |
| standard error | SE |
| variance | |
| population | Var |
| sample | var |

*FISHERY MANAGEMENT REPORT NO. 16-30*

# PASAGSHAK RIVER WEIR REPORT, 2016

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# ABSTRACT

A fish-counting weir was installed in the Pasagshak River during 2016 by the Alaska Department of Fish and Game to enumerate sockeye salmon *Oncorhynchus nerka* escapement into Lake Rose Teed. Escapement was enumerated through the weir daily from June 14 through August 15. A floating plastic weir was used this year in lieu of the conventional wood tripod and aluminum panel weir. The floating weir was much more resilient to substrate scouring and organic debris loading. The total number of sockeye salmon counted through the weir was 7,053 fish. Although total escapement rebounded from two seasons of low counts, fish moved slowly during the beginning of the season, and a subsistence, sport, and commercial fishery closure was implemented for 11 days during the beginning of July. Additionally, 2 pink salmon *O. gorbuscha*, 1 chum salmon *O. keta*, 5 coho salmon *O. kisutch*, and 2 Chinook salmon *O. tshawytscha* were counted through the weir. Sockeye salmon were sampled for age, sex, and length after being captured with a beach seine behind the weir. The average length (mid eye to tail fork) of Pasagshak River sockeye salmon escapement was 516 mm, and the dominant age class was age-1.2.



Key words: sockeye salmon, ASL, subsistence, Pasagshak River, Lake Rose Teed


# INTRODUCTION

Pasagshak River, located on the Kodiak road system (Figures 1 and 2), has recently supported one of the largest sockeye salmon *Oncorhynchus nerka* subsistence fisheries for Kodiak Island residents (Alaska Department of Fish and Game [ADF&G] subsistence database; Figures 3 and 4). During the past two decades, subsistence harvest of Pasagshak River sockeye salmon has increased disproportionately to escapement (Figure 3). During 2014 and 2015, sockeye salmon escapement at the Pasagshak River has been lower than recent years and has failed to meet the peak aerial survey based lower bound sustainable escapement goal (SEG) of 3,000 fish (Figure 3).

Previous escapement enumeration methodology provided only postseason estimates via aerial and foot surveys of the spawning grounds, making inseason subsistence and sport fisheries management impossible and refinement of an escapement goal for this stock problematic. A conventional wood tripod and aluminum panel weir was constructed near the outlet of the lake by ADF&G during 2011 through 2015, and a floating weir was constructed midway through 2015 and utilized in 2015 and 2016 to provide timely and accurate escapement information to help maintain the sustainability of this important subsistence and recreational-use salmon run.

The Pasagshak River is located on the northeast side of Kodiak Island and is accessible by car from the city of Kodiak (Figure 1). Lake Rose Teed (formerly spelled Rose Tead), which drains into the Pasagshak River, is a small, shallow lake (0.94 $km^2$; 2.1 m average depth). Prior to the 1964 earthquake and subsequent tsunami, Lake Rose Teed had little salmon-rearing habitat; however, the earthquake lowered the elevation of the lake, allowing nutrient rich marine water to enter the lake during high tide cycles, dramatically increasing the salmon-rearing potential (Murray 1986). Pasagshak River State Recreational Site is the only designated park land that is outside the immediate city area but still within the road system (Figure 2). The mouth of the Pasagshak River is also a prehistoric native settlement site (P. Saltonstall, Curator, Alutiiq Museum, Kodiak, personal communication).

From 1968 to 2010, Pasagshak River salmon escapement had been estimated postseason using both aerial and foot surveys of the spawning grounds. Although annual survey estimates have been highly variable, sockeye salmon production has generally increased through that time period (Figure 3). Surveys took place on the spawning grounds and estimates of the escapement were not made until well after the fish escaped the subsistence, sport, and commercial fisheries.

Because escapement was not estimated in season, no management action to regulate harvests was possible, and overharvest could have occurred without being detected at which point any action would be too late. The current escapement goal for Pasagshak River sockeye salmon is a lower-bound sustainable escapement goal of 3,000 fish (Sagalkin et al. 2013) based on peak aerial surveys.

Subsistence harvest of this salmon stock increased from the time subsistence records were initiated in 1986 through 2004 and has remained fairly constant until the 2014 season. During 2008, 2009, and 2013, the Pasagshak River was the largest subsistence salmon fishery in the Kodiak Management Area (Figure 4; ADF&G Subsistence Database; KMA). During recent years prior to 2010, two other significant sockeye salmon runs near the City of Kodiak, Afognak and Buskin lakes, experienced significant reductions in run size, restricted fishing opportunities, and total subsistence fishing closures in some years (Baer et al. 2009; Dinnocenzo et al. 2009; Jackson et al. 2010). Such restrictions on stocks can displace users to other systems (Magdanz et al. 2003), leading to concern that without a weir in place, Pasagshak River sockeye salmon would incur increased harvest pressure while ADF&G was unable to monitor escapement in season.

Timely inseason estimates of Pasagshak River sockeye salmon escapement were made during 2011 through 2016 by operation of a weir near the outlet of Lake Rose Teed. Age, sex, and length (ASL) data was also collected with a trap attached to the upstream portion of the weir as well as a beach seine downstream of the weir.

In addition to the installation and annual operation of the escapement monitoring weir, important information on subsistence effort at the Pasagshak River was obtained through harvester interviews conducted by ADF&G technicians. Subsistence harvests ASL data augment ASL data obtained from the weir trap and beach seine and provide valuable information on the harvest composition, size selectivity, and magnitude relative to escapement.

# METHODS

The Pasagshak River weir was installed and fish tight on June 14, 2016, approximately 300 m downstream of the outlet of Lake Rose Teed, and escapement was enumerated through August 15. Operation of the weir was conducted in accordance with the Pasagshak River salmon weir operational plan (Witteveen 2016). The gate to allow fish passage was opened daily, approximately every two to four hours between 7:00 AM and midnight. All species including sockeye, pink *O. gorbuscha*, coho *O. kisutch*, chum salmon *O. keta*, Chinook salmon *O. tshawytscha*, and Dolly Varden *Salvelinus malma*, were enumerated.

During the high tidal cycles (with high tides of 9.3 ft or greater), a strong upstream current occurs at the weir location. With the knowledge gained from the 2011 season that weir panels had to be secured to the tripods with Telespar[1] tubing and lag bolts, the weir was able to withstand those currents during 2012 through 2014. Increased algal debris encountered during 2015 resulted in scouring of the river bottom and maintaining the weir was even more difficult than in previous years. As a result, a PVC floating weir with a heavy chain anchoring system was acquired from the Fish and Game office in Homer and was utilized during 2015 and 2016. This weir allowed easier cleaning and the chain conformed to the river bottom so that substrate

[1] Product names are included for completeness but do not constitute endorsement.

scouring did not occur, resulting in a hole through which fish could escape. Additional chain was added in 2016 to withstand the heavy currents. This increased the efficacy of the weir remaining fish tight and significantly reduced the workload of keeping the weir free of debris.

ASL sampling from sockeye escapement was conducted with a season goal of 600 fish. A beach seine was utilized during 2016 to sample directly behind the weir because it was found to be more effective than managing a trap integrated with the weir. Adipose fins were clipped from fish as they were sampled. All scales, when possible, were collected from the preferred area of each fish following procedures outlined by the International North Pacific Fisheries Commission (INPFC 1963). The "preferred scale" (located on the left side of the fish, 2 rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin) was removed with forceps and mounted on a scale "gum" card. The sex and length of the fish (fish length in millimeters from mid eye to tail fork [METF]) were also recorded.

All scales collected were mounted on scale cards and impressions were made on cellulose diacetate (Clutter and Whitesel 1956). Fish ages were assigned by examining scale impressions for annual growth increments using a microfiche reader fitted with a 48× lens following designation criteria established by Mosher (1968). Ages were entered directly into the salmon database using European notation (Koo 1962), in which a decimal separates the number of winters spent in fresh water (after emergence) from the number of winters spent in salt water.

ADF&G technicians opportunistically contacted sockeye salmon subsistence fishermen on the fishing grounds in front of the Pasagshak River or at Pasagshak State Recreation Area boat landing; however, there was limited opportunity due to fishery closure during the middle part of the season.

# RESULTS

The total sockeye salmon escapement through the Pasagshak River weir in 2016 was 7,053 fish including an inriver estimate of 650 fish after the weir was removed (Table 1). In addition, 2 pink, 1 chum, and 5 coho, and 2 Chinook salmon (Table 1) passed through the weir. The daily sockeye salmon escapement lacked a defined peak, and several fish remained behind the weir in a deep hole for extended periods prior to passing the weir (Figures 6 and 7). Sockeye salmon were often observed holding in various portions of the river for several days before they approached and passed through the weir, so salmon entry into the river may be related to tidal cycles but passage through the weir may be delayed, masking the relationship. The number of fish holding in the hole and observed downstream were estimated when the weir was pulled for the season and added to the total escapement as a post-weir estimate (Table 1).

During previous years, scouring of the substrate below the fish trap made sampling difficult, so a beach seine was used exclusively during 2016. Fish sampled for ASL were captured with the beach seine directly behind the weir weekly and then released upstream of the weir. A total of 652 samples were ageable.

The primary age of Pasagshak River sockeye salmon escapement was age-1.2 fish, which compose about 34.4 percent of the escapement (Table 2). There were also large percentages of age-1.3 (24.3%), -0.2 (19.5%), and -0.3 (17.3%) fish in the escapement. There were few observable temporal trends in the escapement age compositions with the age-1.2 fish increasing slightly during the season and the age-0.3 fish decreasing slightly during the season. The 2016 age composition structure was similar to the 2015 season (Figure 8; Witteveen 2011 – 2015)

with age-1.2 making up the largest percentage for the second time; all other years observed were notably different and highly variable.

Pasagshak River sockeye salmon are typically large compared to other Kodiak Management Area sockeye salmon (ADF&G Age, sex, and length salmon database). During 2016, the average length of sockeye salmon was 516 mm from the escapement (Table 3).There was a higher proportion of ocean-age-2 fish during 2015 and 2016, which probably contributed to the smaller average size. Data from other sockeye salmon systems in the Kodiak area have not been compiled yet, so it is unknown how Pasagshak River sockeye salmon size compares to the rest of the Kodiak systems.

The Pasagshak Bay subsistence fishery was difficult to sample once again due to the common practice of fishermen cleaning their fish on the fishing grounds, making them unavailable for sampling. Despite this, the crew was able to collect 79 ageable scale samples (Tables 4 and 5).

# DISCUSSION

Passage of sockeye salmon through the Pasagshak River occurred primarily during July and early August, later than most Kodiak-area early sockeye salmon runs but earlier than most late sockeye salmon runs (Foster 2011). Daily escapement was widely variable and didn't seem to follow any discernible trends. Sockeye salmon escapement into Lake Rose Teed during 2016 was good by the end of the season, although it seemed to start slowly and picked up in July. The subsistence, commercial, and sport fisheries closures during low escapement and high levels of uncertainty appeared to help to increase the escapement levels. The fisheries were reopened on July 14.

The Pasagshak River sockeye salmon size at age was similar to last season, but smaller than average (Figures 9 and 10). Since the age composition was composed of more ocean-age-2 fish in the past two seasons, the average size of the run as a whole was smaller (Witteveen 2011-2015).

Age composition of Pasagshak River fish was primarily age-1.2 fish in 2016, but it also had high proportions of age-0.2, -0.3, and -1.3 fish. The high proportion of age-0.2 and -0.3 fish is less common in most Kodiak area sockeye salmon systems (Foster 2011). Age-0 fish are typically found in locations with characteristics similar to the Pasagshak system, such as Cinder and Ilnik rivers. These systems have a significant estuarine environment, areas with marine nutrient input, and a lack of deepwater overwintering area or protected marine rearing environments. Conversely, nearby stocks such as Saltery and Buskin lakes have deep lakes and lack estuarine habitat and typically do not have a substantial component of age-0 fish. The productive estuarine rearing area probably allows juvenile fish to grow rapidly enough to enter the salt water in their first year.

The variable age composition and varying age trends inseason suggest a dynamic system in which fish exhibit different life histories depending on variable freshwater conditions (Figure 8). It is reasonable to conclude that run size in this system could be widely variable between years.

Subsistence harvest effort was similar compared to other years during the beginning and end of the season; however, the fishery was closed during July 2 through July 13, which is during the historical peak of subsistence fishing (Figure 11). The age composition in the subsistence fishery was similar to the escapement age composition (Tables 2 and 4) with slightly higher proportions

of ocean-age-3 fish. This is an expected difference in age compositions because gillnets tend to select for larger, older fish. Subsistence harvest records are not available until later in the year.

The floating weir installed this season was much more resilient to scouring and upstream flow during high tide cycles and was easier to clean than the tripod weir. During very large tides, the current was strong enough to flip the middle of the floating weir upstream; however, it still remained fish tight (Figure 12).

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# TABLES AND FIGURES

Table 1.–Daily and cumulative counts of salmon passage through the Pasagshak River weir, 2016.

| | Number of Salmon | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Sockeye Daily | Sockeye Cum. | Pink Daily | Pink Cum. | Chum Daily | Chum Cum. | Coho Daily | Coho Cum. | Chinook Daily | Chinook Cum. |
| 14-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-Jun | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-Jun | 55 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-Jun | 58 | 115 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20-Jun | 10 | 125 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21-Jun | 4 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22-Jun | 50 | 179 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | 12 | 191 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24-Jun | 0 | 191 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-Jun | 18 | 209 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-Jun | 0 | 209 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-Jun | 3 | 212 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-Jun | 0 | 212 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29-Jun | 161 | 373 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-Jun | 67 | 440 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-Jul | 564 | 1,004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Jul | 424 | 1,428 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-Jul | 200 | 1,628 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-Jul | 75 | 1,703 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5-Jul | 91 | 1,794 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6-Jul | 0 | 1,794 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7-Jul | 10 | 1,804 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 8-Jul | 510 | 2,314 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 9-Jul | 129 | 2,443 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 2 |
| 10-Jul | 275 | 2,718 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 11-Jul | 366 | 3,084 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 12-Jul | 0 | 3,084 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 13-Jul | 0 | 3,084 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 14-Jul | 1 | 3,085 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 15-Jul | 126 | 3,211 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 16-Jul | 0 | 3,211 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 17-Jul | 141 | 3,352 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 18-Jul | 0 | 3,352 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 19-Jul | 31 | 3,383 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 20-Jul | 664 | 4,047 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 21-Jul | 197 | 4,244 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 22-Jul | 0 | 4,244 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |

-continued-

Table 1.–Page 2 of 2.

| | Number of Salmon | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Sockeye Daily | Sockeye Cum. | Pink Daily | Pink Cum. | Chum Daily | Chum Cum. | Coho Daily | Coho Cum. | Chinook Daily | Chinook Cum. |
| 23-Jul | 0 | 4,244 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 24-Jul | 322 | 4,566 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 25-Jul | 30 | 4,596 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 26-Jul | 202 | 4,798 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 27-Jul | 39 | 4,837 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 28-Jul | 101 | 4,938 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 29-Jul | 398 | 5,336 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 30-Jul | 32 | 5,368 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 31-Jul | 5 | 5,373 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 1-Aug | 0 | 5,373 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 2-Aug | 28 | 5,401 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 3-Aug | 3 | 5,404 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 4-Aug | 0 | 5,404 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 5-Aug | 138 | 5,542 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 6-Aug | 0 | 5,542 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 7-Aug | 0 | 5,542 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 8-Aug | 0 | 5,542 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 9-Aug | 190 | 5,732 | 1 | 2 | 0 | 1 | 1 | 1 | 0 | 2 |
| 10-Aug | 177 | 5,909 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 2 |
| 11-Aug | 183 | 6,092 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 2 |
| 12-Aug | 0 | 6,092 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 2 |
| 13-Aug | 0 | 6,092 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 2 |
| 14-Aug | 210 | 6,302 | 0 | 2 | 0 | 1 | 4 | 5 | 0 | 2 |
| 15-Aug | 21 | 6,323 | 0 | 2 | 0 | 1 | 0 | 5 | 0 | 2 |
| 16-Aug | 80 | 6,403 | 0 | 2 | 0 | 1 | 0 | 5 | 0 | 2 |
| Post Weir | 650 | | | | | | | | | |
| Total | | 7,053 | | 2 | | 1 | | 5 | | 2 |

Table 2.–Estimated age composition of Pasagshak River sockeye salmon escapement, 2016 (interpolated between sampling events).

| Stat Week | Sample Fish | | Ages 0.2 | 0.3 | 1.1 | 1.2 | 1.3 | 1.4 | 2.2 | 2.3 | Total Fish |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 0 | Percent | 22.6 | 19.4 | 0.0 | 32.3 | 25.8 | 0.0 | 0.0 | 0.0 | 100 |
| 6/7-6/13 | | Numbers | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | 0 | Percent | 22.6 | 19.4 | 0.0 | 32.3 | 25.8 | 0.0 | 0.0 | 0.0 | 100 |
| 6/14-6/20 | | Numbers | 28 | 24 | 0 | 40 | 32 | 0 | 0 | 0 | 125 |
| 26 | 31 | Percent | 23.9 | 19.6 | 0.0 | 33.1 | 23.0 | 0.0 | 0.3 | 0.0 | 100 |
| 6/21-6/27 | | Numbers | 20 | 17 | 0 | 28 | 21 | 0 | 0 | 0 | 87 |
| 27 | 78 | Percent | 25.6 | 20.9 | 0.0 | 35.3 | 17.2 | 0.0 | 1.0 | 0.0 | 100 |
| 6/28-7/4 | | Numbers | 393 | 311 | 0 | 530 | 240 | 0 | 17 | 0 | 1491 |
| 28 | 98 | Percent | 13.7 | 23.6 | 0.0 | 35.2 | 27.4 | 0.0 | 0.2 | 0.0 | 100 |
| 7/5-7/11 | | Numbers | 170 | 328 | 0 | 491 | 392 | 0 | 1 | 0 | 1,381 |
| 29 | 62 | Percent | 14.9 | 20.4 | 0.0 | 41.1 | 23.5 | 0.0 | 0.0 | 0.2 | 100 |
| 7/12-7/18 | | Numbers | 41 | 53 | 0 | 113 | 61 | 0 | 0 | 1 | 268 |
| 30 | 66 | Percent | 20.6 | 14.3 | 0.0 | 35.8 | 27.9 | 0.3 | 0.0 | 1.1 | 100 |
| 7/19-7/25 | | Numbers | 249 | 180 | 0 | 446 | 352 | 2 | 0 | 15 | 1,244 |
| 31 | 69 | Percent | 24.4 | 16.1 | 0.0 | 36.1 | 22.3 | 1.1 | 0.0 | 0.1 | 100 |
| 7/26-8/1 | | Numbers | 194 | 117 | 0 | 280 | 174 | 9 | 0 | 1 | 777 |
| 32 | 106 | Percent | 19.3 | 21.4 | 0.2 | 36.1 | 22.7 | 0.2 | 0.0 | 0.2 | 100 |
| 8/2-8/8 | | Numbers | 33 | 39 | 0 | 61 | 37 | 0 | 0 | 0 | 169 |
| 33 | 67 | Percent | 16.5 | 12.8 | 1.3 | 41.0 | 27.4 | 0.0 | 0.0 | 1.0 | 100 |
| 8/9-8/15 | | Numbers | 130 | 111 | 10 | 309 | 213 | 0 | 0 | 8 | 781 |
| 34 | 75 | Percent | 16.0 | 5.3 | 1.3 | 50.7 | 26.7 | 0.0 | 0.0 | 0.0 | 100 |
| 8/16-8/22 | | Numbers | 117 | 39 | 10 | 370 | 195 | 0 | 0 | 0 | 730 |
| Totals | 652 | Percent | 19.5 | 17.3 | 0.3 | 37.8 | 24.3 | 0.2 | 0.2 | 0.3 | 100 |
| | | Numbers | 1,375 | 1,219 | 20 | 2,669 | 1,717 | 12 | 17 | 24 | 7,053 |

Table 3.–Length composition of Pasagshak River sockeye salmon escapement samples by age and sex, 2016.

| | Ages | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 1.1 | 1.2 | 1.3 | 1.4 | 2.2 | 2.3 | Total |
| Mean Length Females | 487 | 529 | 0 | 490 | 525 | 543 | 525 | 525 | 504 |
| Standard Error Females | 3.4 | 3.1 | 0.0 | 2.0 | 3.7 | 0.0 | 0.0 | 0.0 | 2.2 |
| Range Females | 434-572 | 447-579 | | 430-591 | 436-576 | 543-543 | 525-525 | 525-525 | 430-591 |
| Sample Size Females | 61 | 51 | 0 | 134 | 77 | 1 | 1 | 1 | 326 |
| Mean Length Males | 503 | 553 | 352 | 505 | 561 | 0 | 0 | 561.0 | 528 |
| Standard Error Males | 3 | 2 | 14 | 3 | 3 | 0 | 0 | 0 | 2 |
| Range Males | 436-564 | 503-602 | 338-365 | 428-592 | 485-610 | | | 561-561 | 338-610 |
| Sample Size Males | 62 | 66 | 2 | 113 | 82 | 0 | 0 | 1 | 326 |
| Mean Length | 495 | 543 | 352 | 497 | 544 | 543 | 525 | 543 | 516 |
| Standard Error | 2.3 | 2.2 | 13.5 | 1.7 | 2.7 | 0.0 | 0.0 | 18.0 | 1.5 |
| Range | 434-572 | 447-602 | 338-365 | 428-592 | 436-610 | 543-543 | 525-525 | 525-561 | 338-610 |
| Sample Size | 123 | 117 | 2 | 247 | 159 | 1 | 1 | 2 | 652 |

Table 4.–Estimated age composition of Pasagshak Bay sockeye salmon subsistence harvest, 2016.

| | | Ages | | | | |
|---|---|---|---|---|---|---|
| Stat Week | | 0.2 | 0.3 | 1.2 | 1.3 | Total |
| 25 (Jun 14 - Jun 20) | Number | 1 | 8 | 2 | 2 | 13 |
| | Percent | 7.7 | 61.5 | 15.4 | 15.4 | |
| 26 (Jun 21 - Jun 27) | Number | 8 | 7 | 3 | 6 | 24 |
| | Percent | 33.3 | 29.2 | 12.5 | 25.0 | |
| 27 (Jun 28 - Jul 04) | Number | 1 | 0 | 0 | 1 | 2 |
| | Percent | 50.0 | 0.0 | 0.0 | 50.0 | |
| 30 (Jul 19 - Jul 25) | Number | 7 | 10 | 7 | 16 | 40 |
| | Percent | 17.5 | 25.0 | 17.5 | 40.0 | |
| Total: | Number | 17 | 25 | 12 | 25 | 79 |
| | Percent | 21.5 | 31.6 | 15.2 | 31.6 | |

Table 5.–Length composition of Pasagshak Bay sockeye salmon subsistence harvest samples by age and sex, 2016

| | Ages | | | | |
|---|---|---|---|---|---|
| | 0.2 | 0.3 | 1.2 | 1.3 | Total |
| Mean Length Females | 502.75 | 524.1 | 488 | 541.43 | 520 |
| Standard Error Females | 8.2 | 11.2 | 13.2 | 5.3 | 6.0 |
| Range Females | 481-519 | 435-556 | 460-511 | 521-560 | 435-560 |
| Sample Size Females | 4 | 10 | 4 | 7 | 25 |
| Mean Length Males | 514 | 547.4 | 507.13 | 558.22 | 537 |
| Standard Error Males | 5.7 | 4.9 | 9.5 | 5.1 | 4.1 |
| Range Males | 490-554 | 508-586 | 476-555 | 513-605 | 476-605 |
| Sample Size Males | 13 | 15 | 8 | 18 | 54 |
| Mean Length | 511.35 | 538.08 | 500.75 | 553.52 | 532 |
| Standard Error | 4.8 | 5.7 | 7.8 | 4.2 | 3.5 |
| Range | 481-554 | 435-586 | 460-555 | 513-605 | 435-605 |
| Sample Size | 17 | 25 | 12 | 25 | 79 |

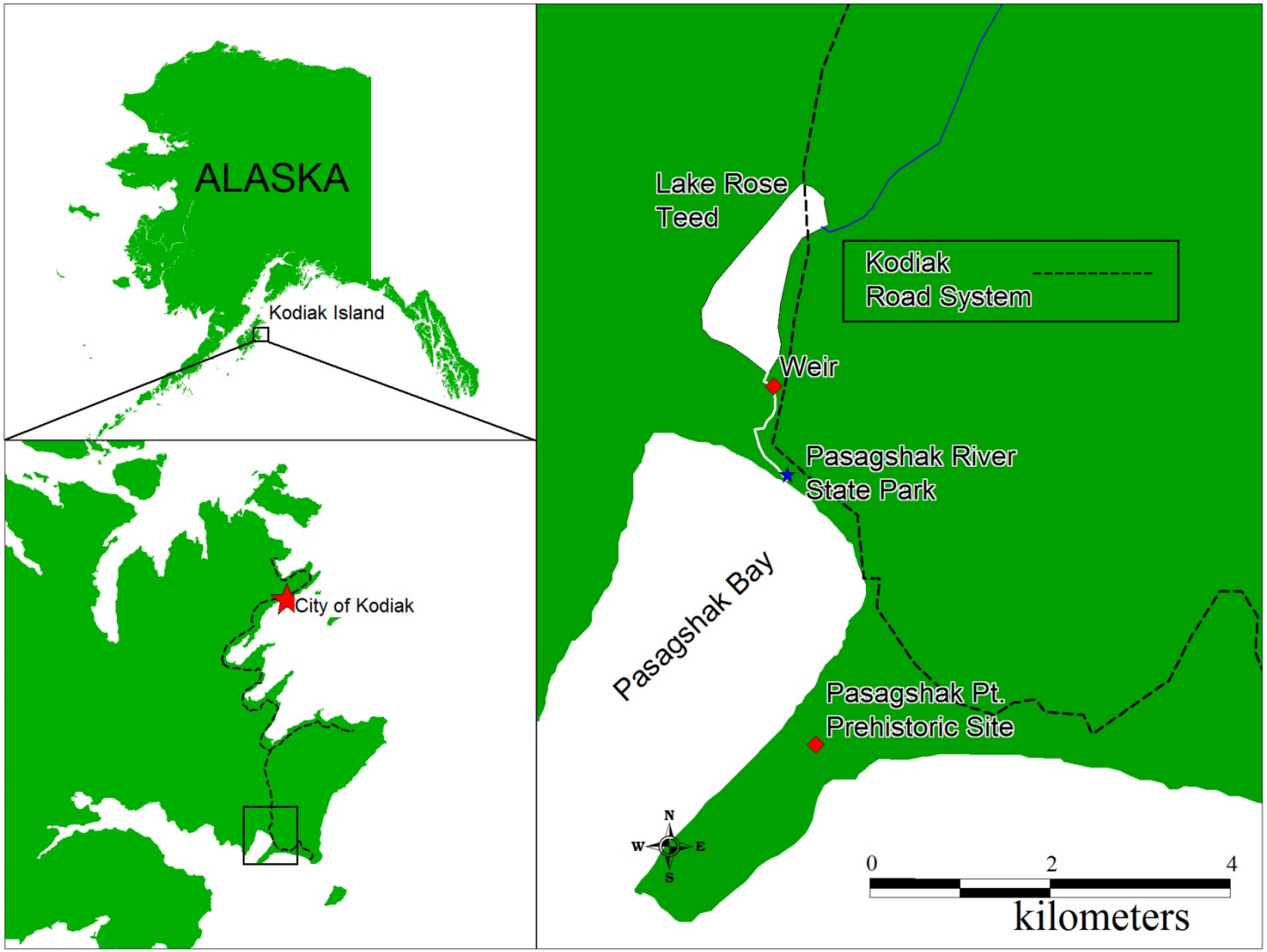


Figure 1.–Map depicting Pasagshak Bay and Lake Rose Teed area on the Kodiak road system.

Figure 2.–Aerial view of the mouth of Pasagshak River, Lake Rose Teed and the Pasagshak River State Recreation Area.

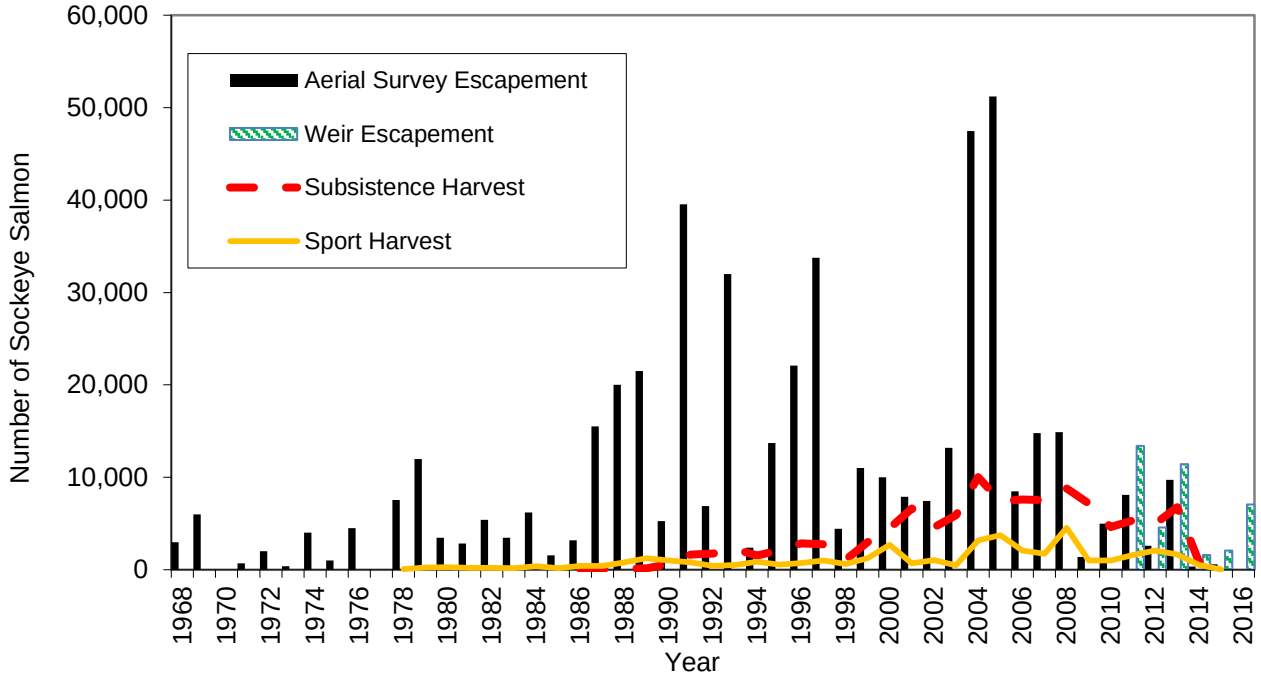


Figure 3.–Historical estimated sockeye salmon escapement and sport and subsistence harvest at Pasagshak River.

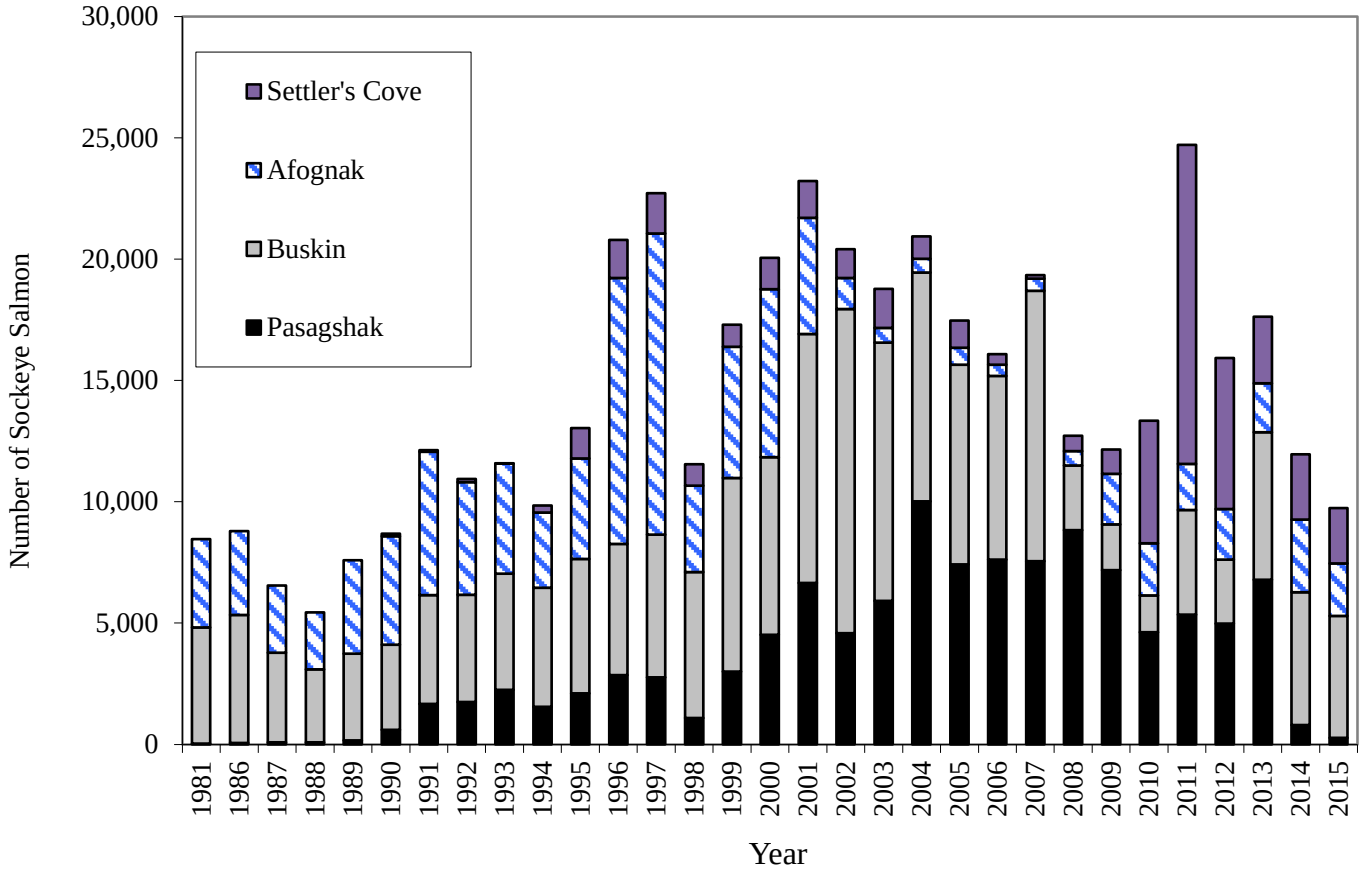


Figure 4.–Historical sockeye salmon subsistence harvest estimates for four important subsistence systems near the City of Kodiak.

Figure 5.–Pasagshak River floating weir, 2016.

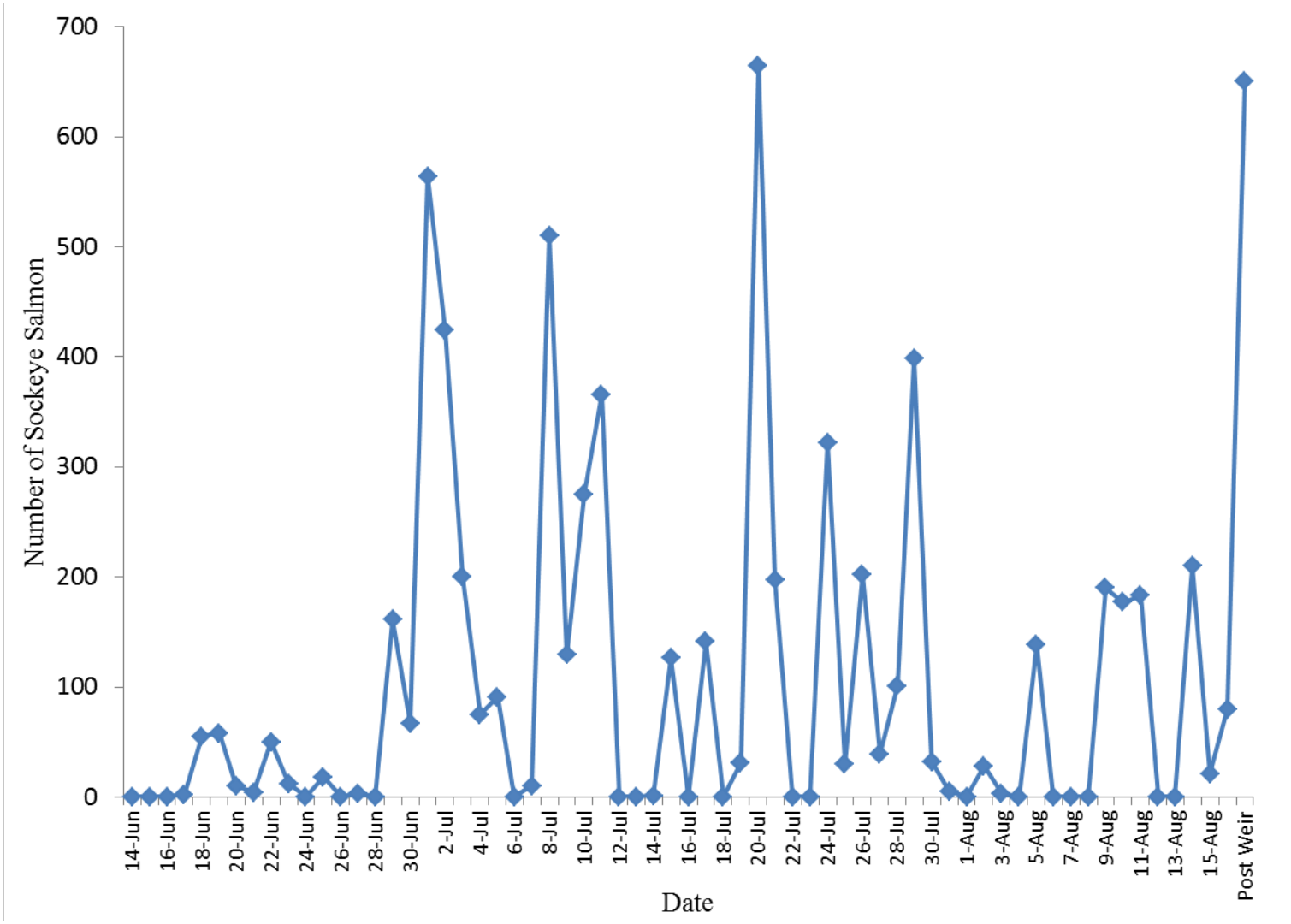


Figure 6.–Daily sockeye salmon passage through the Pasagshak River weir, 2016.

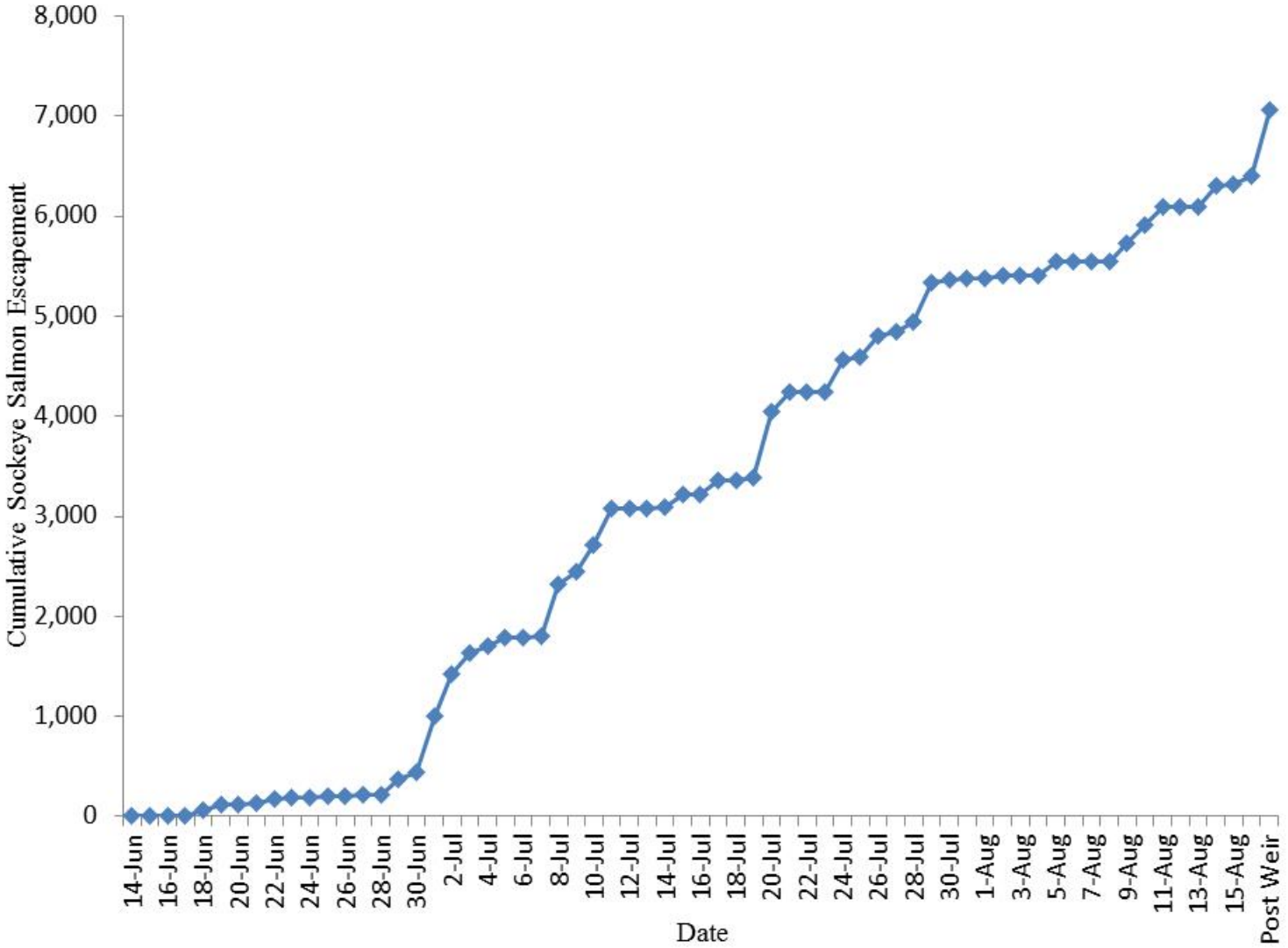


Figure 7.–Pasagshak River sockeye salmon cumulative escapement by day, 2016.

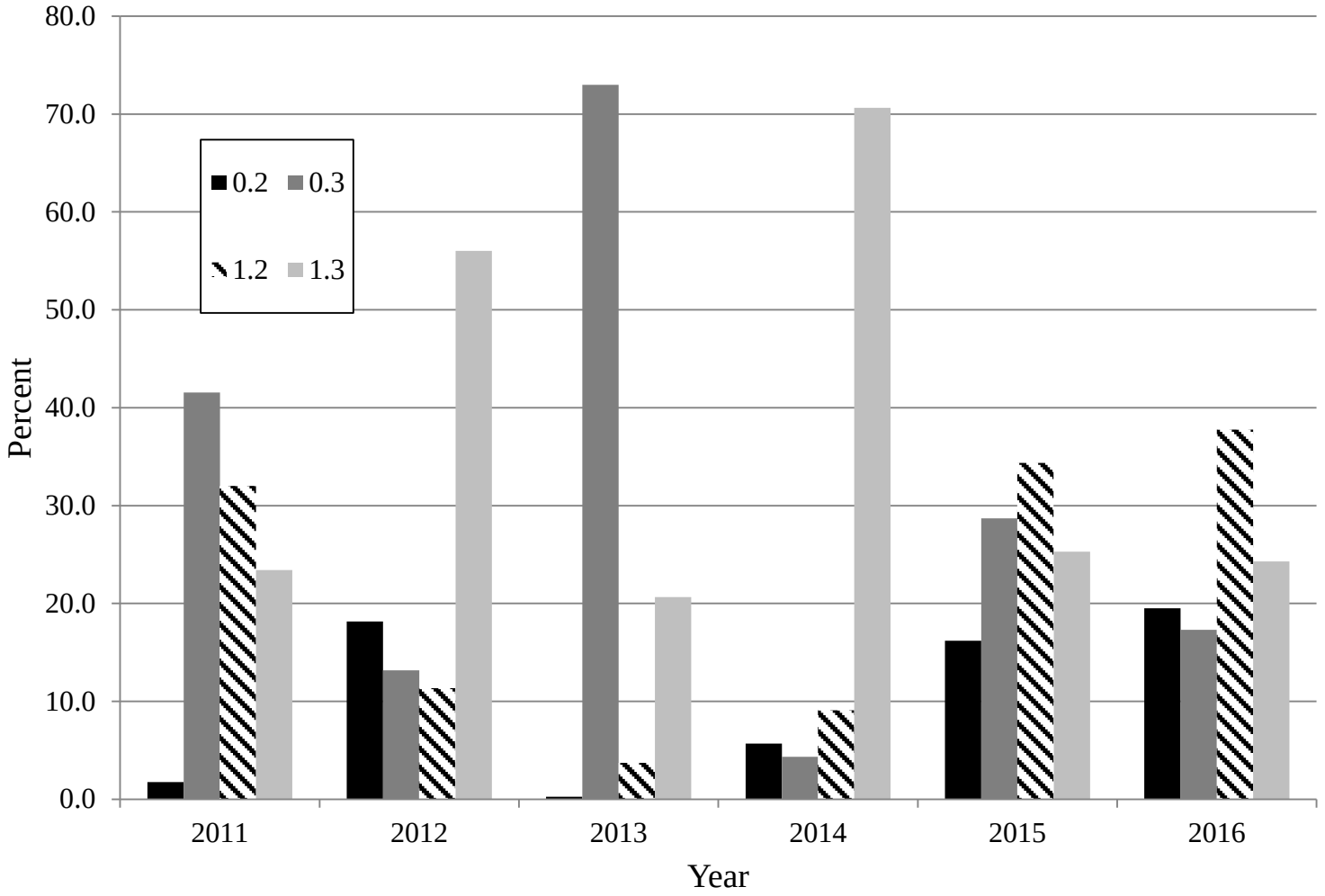


Figure 8.–Major age-class percentage of Pasagshak River sockeye salmon escapement, 2011–2016.

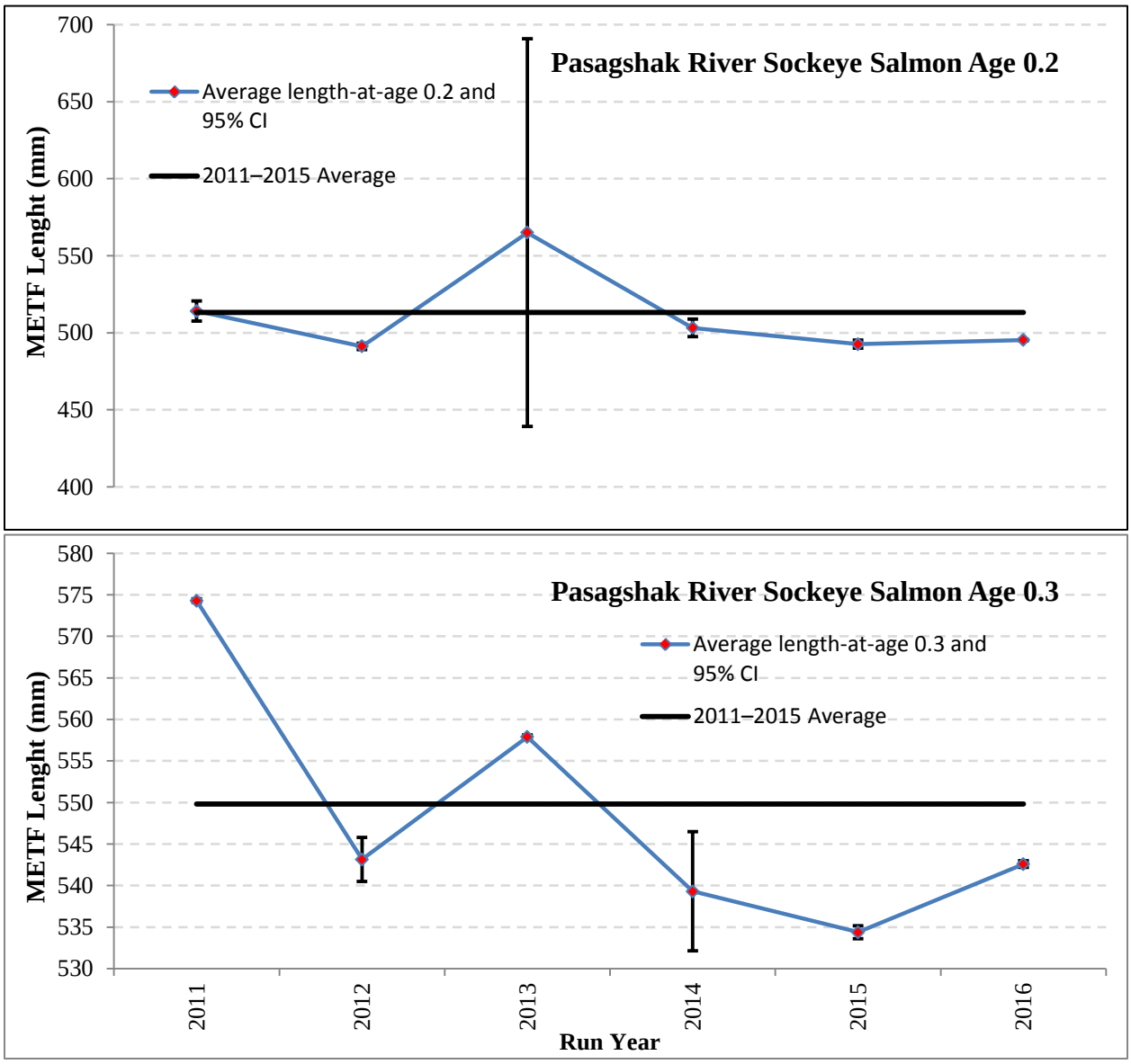


Figure 9.–Size at age of age-0.2 and -0.3 sockeye salmon from Pasagshak River, 2011-2016.

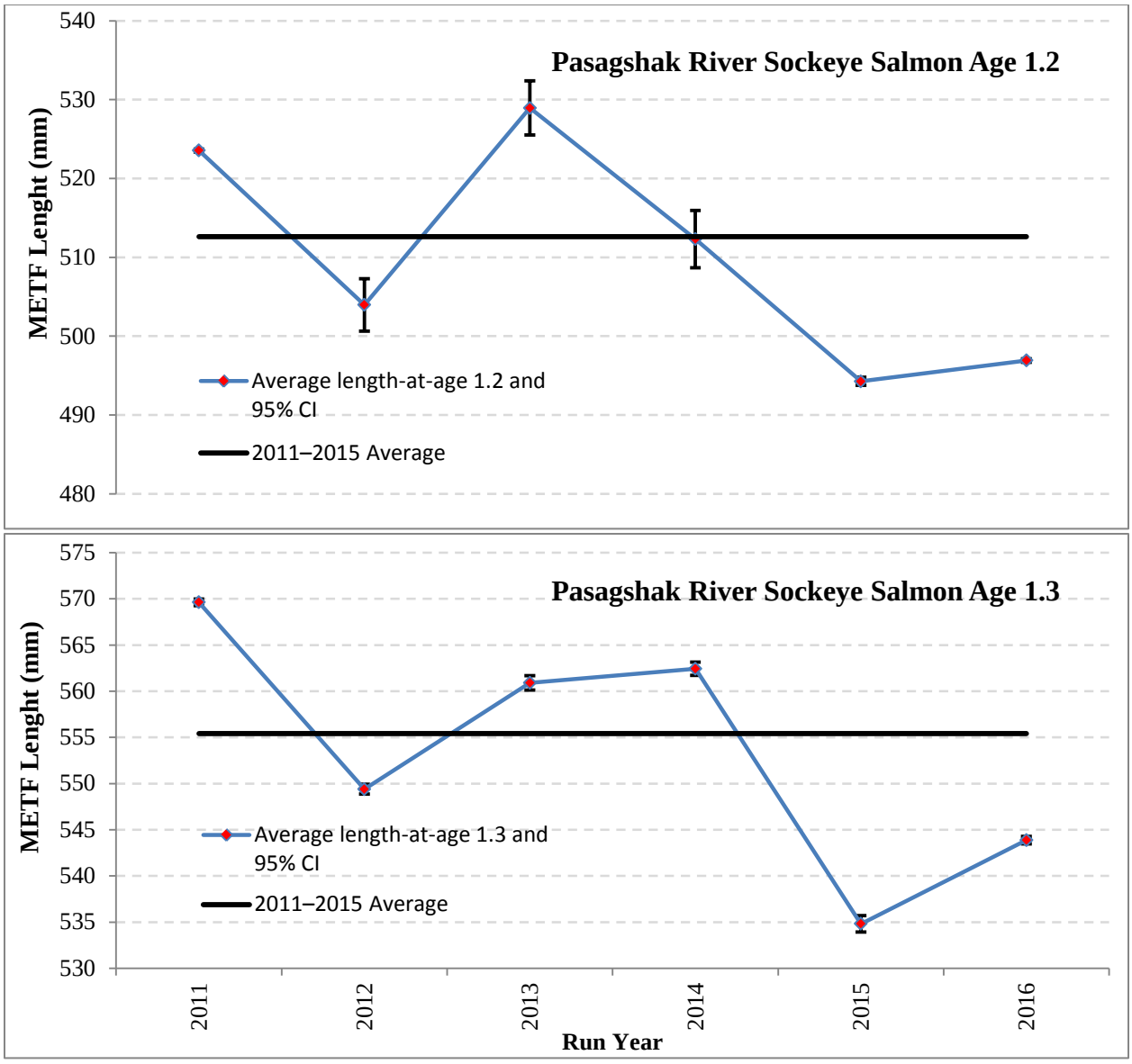


Figure 10.–Size at age of age-1.2 and -1.3 sockeye salmon from Pasagshak River, 2011-2016.

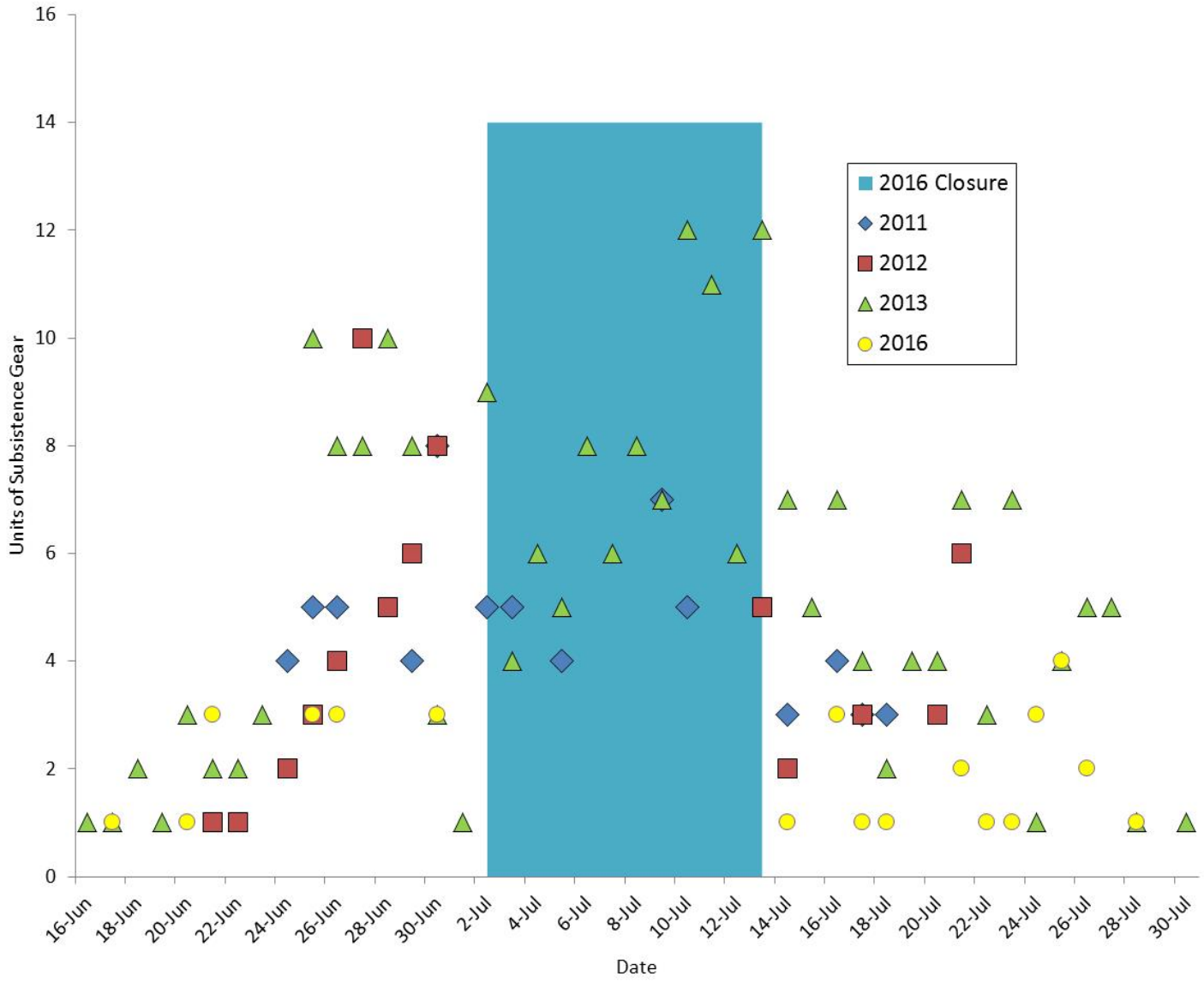


Figure 11.–Subsistence fishing effort observed in Pasagshak Bay (fishery closure during 2014-2015).

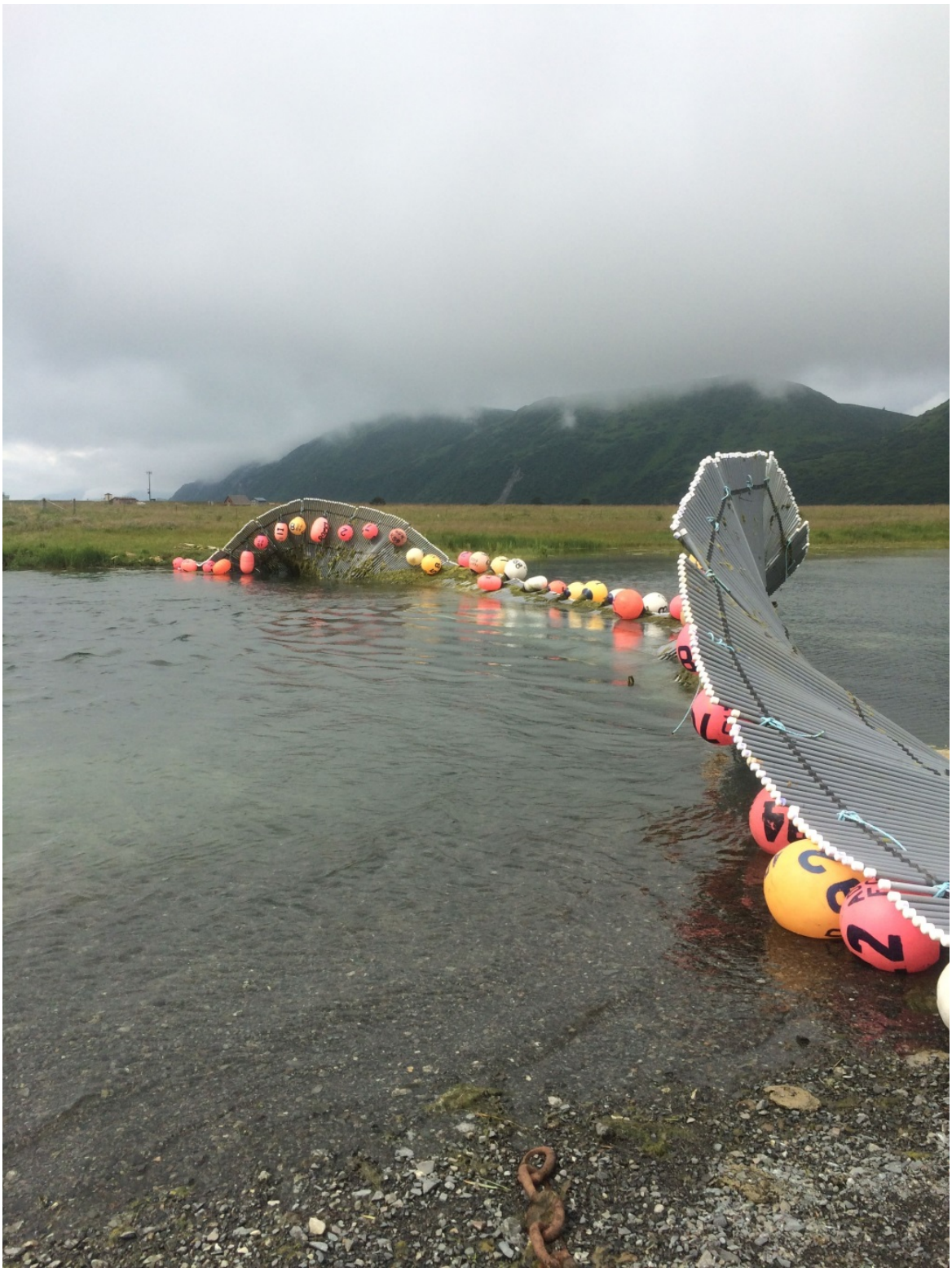

Figure 12.–Pasagshak River floating weir flipped upstream after large upstream current.